

OPEN BOOK EVALUATION IN SCIENCE

**J. P. AGARWAL
READER**



**Department of Measurement, Evaluation, Survey and Data Processing
National Council of Educational Research & Training
Sri Aurobindo Marg, New Delhi-110016**

PREFACE

The National Policy on Education 1986, emphasizes "to recast the examination system so as to ensure a method of assessment that is a valid and reliable measure of student development and a powerful instrument for improving teaching and learning. In this context, Open Book Examination is considered as one of the important techniques of examination reform to make the existing pattern more comprehensive, continuous and formative. However, the success of this approach depends upon shifting emphasis from single "end-of-the-course examination" to periodical testing as well as giving appropriate weightages to assignments, projects and Open Book Tests.

The technique of Open Book Evaluation alongwith assignments and project-work can provide more reliable evidence about the attainment of higher mental abilities. If introduced appropriately it stimulates pupils to acquire information from different sources, organise the material coherently and express ideas succinctly in the form and style desired. Considering these advantages of open book evaluation, it was decided to develop relevant material for this purpose. Therefor, sample questions and sample reports of ^{an} assignment and of a project work were developed in a workshop organised for the "Development of sample Questions in Science (Biology) for Open Book Examination for Class IX" from March 7-14, 1989. The material was then reviewed

critically in a vetting workshop organised at the NIE Campus. Thus, practising teachers, subject experts and educationists have participated in the development of this material. Afterwards, the material was edited and brought to the present form.

I am confident that teachers and teacher educators would make an effective use of this material and prepare their own question-banks for open book evaluation including comprehensive lists of projects and assignments which can be carried out by the science students of secondary classes. Comments and suggestions from teachers, teacher-educators and others for further improving the material are earnestly solicited and will be thankfully received.

J. P. AGARWAL
Reader

OPEN BOOK EVALUATION IN SCIENCE FOR CLASS XI

(

Foreword

Preface

I	Open Book Evaluation	1.1
II	Assignments and Project	2.1
III	Pupil's Report of the Project	3.1
IV	Pupil's Report of the Assignment	4.1
V	Objective-based Test Items	5.1
VI	Scoring-key of the Test Items	6.1
VII	Question-wise Analysis of the Test Items	7.1

APPENDICES

- A. List of Instructional Objectives
- B. Item Sheet
- C. List of Participants
- D. Bibliography

OPEN BOOK EVALUATIONCLOSED BOOK EVALUATION.

Evaluation occupies an important position in any system of education. In fact, it is the part and parcel of the teaching-learning process. Each pupil is eager to know what abilities and skills he has acquired. Teachers, too, are very much concerned to find-out the success of their instructional programme on one hand, and the progress of their pupils according to their abilities, on the other. The parents also need to know the progress of their wards time to time. These expectations of teachers, pupils and parents directed the school to organise evaluation more frequently than confining to one terminal examination only at the close of the academic year.

The above change in emphasis from single examination to periodical testing throughout the academic year would make the school evaluation diagnostic, formative, and continuous integrating testing with teaching. However, these tests and examinations by and large test mainly the reproduction of memorised information and does not lead to inculcate the spirit of self-appreciation, self-exploration and self-development of personal and social values among the young learners. Therefore, introduction of open book evaluation and oral testing along with existing closed book evaluation is gaining support day-by-day. An

(1.2)

appropriate emphasis on assignments and projects is also thought necessary for developing and testing higher mental abilities, skills and values.

CONCEPT OF OPEN BOOK EVALUATION:

The open book evaluation is a positive approach aiming at developing and measuring abilities of comprehension, classification, interpretation, analysis, reasoning, generalizing, evaluation, etc., on one hand, and to locate information, select the relevant material, organise it coherently and succinctly, and report in a desired style, on the other. It stimulates pupils to consult books, periodicals and other reference materials, and eliminates the fear and tension created by closed book examinations. In fact, in an open book examination, the examinee has a free access to the prescribed textbooks and other reference material which reduces the role of memory and opens the way of testing pupils' attainments at higher cognitive levels.

The open book approach, if followed in day-to-day teaching or testing would develop reading habit among the pupils. They would like to collect relevant information in response to solve an interesting problem raised in the class-room. The assignments and projects should be planned in such a way that they may force pupils to collect and organise information from two or more reference books and periodicals. This would enable pupils to consult books

(1.3)

both in the school library as well as at home. When this habit is imbibed appropriately the problems of indiscipline and mal-practices during examinations would be overcome automatically.

The open book evaluation is not aimed at replacing the closed book examinations but rather to counter the ill-effects of the latter as efficiently as possible. Over-emphasis on memorization, too much significance associated with end-of-the-term examination, and increasing malpractices during and after the actual conduct of examinations are the major weaknesses of the closed book examinations. These can be minimised appreciably if the approach of open book evaluation, along with the closed book evaluation procedures is practised in our schools as a part and parcel of teaching-learning programme. This would make teaching and testing lively and meaningful, securing more and more multilateral interaction and providing better opportunities for the development of higher abilities and skills instead of confining to memorization of facts and figures.

PURPOSES OF OPEN BOOK EVALUATION:

Open book evaluation should help achieve the following purposes:

1. It should stimulate pupils to read textbooks, reference books and science magazines as available in the school library.
2. It should encourage pupils to undertake projects

(1.4)

involving collection and interpretation of data from various sources, i.e. from environmental observation, laboratory experimentation, books, science magazines, etc.

3. It should help pupils develop the ability to collect relevant information, organise it with coherence and express it succinctly in the form and style desired.
4. It should make teaching meaningful and interesting so that pupils participate in class-room discussions as well as complete the assignments and projects in time.
5. It should assist pupils in comprehending the textual information, developing competency in organising it in various ways, i.e. verbal form to tabular form, graphical form to verbal form, verbal form to flow chart, etc.
6. It should guide pupils to develop the ability to observe and interpret natural phenomena, and to tackle novel situations analytically.
7. It should help pupils in evaluating data, statements and opinions scientifically gathering additional information, discussing among the peer group and arriving at conclusions objectively.
8. It should assist pupils to keep off the fear psychosis of tests and examinations.
9. It should lead to adopt discipline and academic honesty by the pupils.

METHODOLOGY FOR IMPLEMENTATION

On book evaluation exists in schools in the form of

(1.5)

assignments and project work. This should be strengthened further and linked well with the entire teaching-learning programme. In addition, open book tests should also be introduced subject-wise at least, one in each session. A total weightage of 20-25% may be allocated to assignments, project work and open book tests in the initial stages. When it proves successful, it could be extended to form a part of the annual examination of the school and 'may' also be included in public examinations as a separate question paper. In no case, open book examinations should be aimed at replacing the closed book examinations as the latter serve an important purpose of remembering significant terms, facts, events, methods, concepts, principles and generalisations which are considered necessary for a well informed citizen.

The implementation of open book evaluation in secondary schools requires certain organisational and academic inputs, specially regarding the provision of adequate number of books and space in the school library, allocation of sufficient time for self-reading, and availability of appropriate sample material for teachers on open book evaluation in each subject. The class-size should also be moderate, i.e. 35-40 students, if not less. The subject teachers may also need orientation. The sample material provided in this handbook would be useful in this regard.

HOW TO USE SAMPLE MATERIAL:

The sample material has been developed in Biology for secondary classes using the text-book titled "Science: A text book for class IX (Part II), published by the National Council

(1.6)

of Educational Research and Training, New Delhi 1988 as the base. The teachers may use it as such if they follow the same course of study. If not, they will need to develop their own evaluation material on parallel lines. For this purpose, it would be useful if subject teachers of different schools may pool their resources in developing the assignments, projects and objective based questions of various forms for open-book tests. The present material would offer necessary guidance in developing suitable test-items as well as assignments and projects.

The present material consists of assignments, projects and test-items multiple-choice, constructed on the following units of study under Biological Science in secondary schools.

Unit 1: Habitats and Adaptations of Living Organism:

SU - 1.1 Habitats: its meaning and Types.

SU - 1.2 Adaptation in Aquatic Habitats.

SU - 1.3 Adaptation in Terrestrial Habitats.

SU - 1.4 Interdependence among organisms.

SU - 1.5 How did Adaptation Occur.

SU - 1.6 Man Manipulates his Habitat.

Unit 2: Birds' Structure and Ways of Living:

SU - 2.1 Habitats and bird populations.

SU - 2.2 Structure of beaks and feeding habit.

SU - 2.3 Bird Movement (Wings, tails, legs and claws of birds).

(1.7)

SU - 2.4 Birds' behaviour (roosting, nesting, breeding etc.)

SU - 2.5 Procedure for observing birds in nature.

Unit 3: Organisation in the Living World:

SU - 3.1 Levels of organisation;

SU - 3.2 General basis of Organisation.

SU - 3.3 Cell structure

SU - 3.4 Mitosis and Meiosis

SU - 3.5 Crossing over and its importance.

Unit 4: Nutritional Metabolism in Plants and Animals

SU - 4.1 Nutrition

SU - 4.2 Photosynthesis

SU - 4.3 Respiration

SU - 4.4 Transport of Material

SU - 4.5 Blood Circulation

SU - 4.6 Lymph

SU - 4.7 Excretion.

Unit 5 : Reproduction and Coordination in Living Organisms:

SU - 5.1 Growth and Reproduction

SU - 5.2 Asexual Reproduction

SU - 5.3 Sexual Reproduction

SU - 5.4 Concept of Control and Coordination

SU - 5.5 Chemical Coordination in Plants

SU - 5.6 Chemical Coordination in animals

SU - 5.7 The Nervous system in animals.

(1.8)

Test items of other form, i.e., very short answer, VSA), short-answer and Long-answers (or Essay) may be framed to test understanding and application objectives sampling the content of the above mentioned units. Teachers are advised to frame questions similarly on other units of study included in the school syllabus. Sample assignment and project are also planned for the pupils involving study of additional literature and also to collect information from the local environment. The teachers may also develop additional assignments and projects suitable to the course of study prescribed.

Objective based test-items of multiple-choice type are given here as sample material for open-book tests in chapter V covering all chapters, i.e., chapter 1 to 21 of the text-book for class IX (part I and II), arranged chapter-wise. More questions may be constructed by the teachers to have a good number of questions for day-to-day use.

.....

II

ASSIGNMENTS AND PROJECTS

Assignments and projects offer a wide variety of learning experiences to the pupils. Both teachers and pupils find them lively, purposeful and educative. Usually an assignment involves a series of pupils-activities to collect relevant information from books, magazines and periodicals and, to present the same in the form of a report assisted by charts, models, graphs, tables line-diagrams, graphic cycles, etc.

1.0 OBJECTIVES OF ASSIGNMENTS/PROJECTS:

Assignments, when planned appropriately achieve the following objectives:

1. develops the habit of reading books, magazines and periodicals purposefully;
2. acquires the skill in collecting and recording data (or information) from various sources efficiently;
3. interprets the data (or information) provided in the form of statements, graphs, tables, diagrams, graphic cycles, etc. appropriately;
4. reinforces and enriches the body of knowledge through self-learning purposely;
5. Analyses and interprets data adequately;
6. translates verbal information in the form of graphs, tables, graphic cycles, diagrams, etc. correctly;

(2.2)

7. communicates his results/ideas in the form of written reports effectively;
8. initiates discussions and expresses his views effectively;
9. practises scientific temper appropriately;
10. inculcates certain personal and social values appreciately, e.g., observer of laboratory rules, recording of data honestly, etc;
11. creates interest in the study of science and its impact on social behaviour;
12. appreciates the role of science in revealing the secrets of nature.

Most teachers usually assign projects to their students which invariably involve experimentation and/or collection of data from the original source. Such projects are often termed as investigatory projects. They help in developing manipulative skills including accurate observation and its objective recording in addition to the objectives listed earlier under Assignments.

In general project work involves laboratory and field work, collection and preservation of materials, observation, recording of information, analysis and interpretation of data, drawing of conclusions, etc. in addition to the study of scientific magazine books and periodicals, as well as reporting of results/findings scientifically.

Both assignments and projects offer a good opportunity to

(2.3)

assess pupil achievements without creating examination fever or mental tension. In fact, they integrate teaching with testing so well that the pupils enjoy to learn while working on them. They also act as excellent tools of open book evaluation. The pupils reveal their attainments in cognitive, affective and connative (psychomotor) domains without any fear or rear. There are neither loss of school time nor an opportunity for malpractices. Considering these facts it is advisable to induct assignments and projects as a part and parcel of the teaching-testing programme of the school.

2.0 PLANNING AND PREPARATION BY THE TEACHER:

Assignments and projects need an efficient planning and adequate preparation on the part of teachers. They have to prepare a list of suitable assignments and projects for pupils and work out details to offer necessary guidance and supervision as well as to provide facilities for books, periodicals, library, equipments and tools for the study. Assignments requiring mere reproduction of the textbook or laboratory guide would not serve the purpose and so the list of assignments and projects should be properly prepared and adequate guidelines be laid down along with each of them.

An assignment is usually given to reinforce pupil's class-room learning as well as to enrich it and so, it must demand subject content beyond the level of the textbook and force the pupil to present it involving a novel organisation and expression.

(2.4)

While assigning projects and assignments to the pupils, detailed instructions should be provided regarding the nature of work and the format of the report. The teacher should also provide the form for reporting the project-work/assignment as given here for guid-

3.0 FORMAT OF THE PROJECT/ASSIGNMENT

3.1 Title of the project or assignments:

It should be precise and self-explanatory about the activities to be undertaken and/or the content area to be sampled. The pupil should be allowed to select the titles from the list offered by the teacher or to submit a new titles of their own choice.

3.2 Introduction: Need and Importance of the assignment/Project.

This should explicit the aim, scope and significance of the study.

3.3 Relevant Theory:

The concepts and principles, if any, associated with the work undertaken may be stated. This is more applicable for projects.

3.4 Procedure or Methods and Materials:

The procedure of carrying out the work may be mentioned along with the materials, tools and techniques employed.

3.5 Collection, Analysis and Interpretation of Data:

The data should be recorded systematically and b

(2.5)

analysed and interpreted as per requirement of the project or assignments.

3.6 Summary and Conclusions:

On the basis of data, results or conclusions, if any, may then be presented or the summary of the assignment/project along with conclusions may be presented.

3.7 Precautions and Limitations:

The precautions which are usually to be observed during the work may be listed clearly. Similarly, limitations, if any should also be recorded. This aspect should invariably be included in preparing a project report.

3.8 Suggestions for further study:

If the work carried out needs further study, it should be mentioned.

3.9 REFERENCES:

A list of science books, magazines and periodicals studied for the study should be enclosed.

This format may be modified as felt necessary. The teacher may act as a guide in taking up the work, carrying it out and finally developing its report. Thus, he/she should assist pupils so that they may complete the task successfully.

4.0 GUIDELINES FOR ASSIGNING PROJECTS AND ASSIGNMENTS:

The teacher may help his/her pupils in selecting a suitable title of a project or an assignment. The title should

(2.6)

be properly worded and necessary details regarding its planning, execution and reporting should be discussed. The pupil should also be assisted by the teacher as and when contacted.

4.1 An example of assigning a project

A project title may be assigned to an individual who may submit their report of work individually or collectively but it is decided in advance.

4.1.1 Project Title:

"Collection, display and compilation of data of 15 edible seeds/grains giving (1) the scientific names, (2) the number of seed leaves (or cotyledons) contained in each, (3) the major food stuff stored in each, and (4) the season of cultivation."

4.1.2 Instructions for students:

1. Carry suitable equipment and materials such as plastic or paper bags, thread, rubber bands, labels, pencil, blade, a pair of scissors, etc.
2. Take permission from the farmer or the shop-keeper for taking the material.
3. Record the date, locality, source and any other relevant information on the spot from where the material has been collected.
4. While collecting the material take the predictions as suggested by the teacher specially the following:

(2.7)

- (i) Material collected is unattached by insects, fungi, bacteria, etc.
- (ii) Material is air/sun dried.
- (iii) Use suitable repellent such as naphthalene balls to prevent insect attack during storage.

5. Do not forget to carry proper collecting and recording material with you.
6. Consult suitable books for getting relevant information about the material collected.
7. Visit the places suggested for procuring the materials and preserve them with appropriate preservatives as provided (or prepared in the laboratory).
8. Prepare appropriate display suitably preserved and labelled.
9. Develop and submit the Project Report within 4 weeks.

4.2 An Example of assigning an Assignment:

An assignment should be given to an individual who should undertake and submit the report individually.

4.1.1 Title of an Assignment

" Draw and label various endocrine glands in a male and human/female and make a detailed study of them

to report location of these glands, hormones secreted

(2.8)

and their functions in a tabular form. Collect information about the abnormalities caused by anomalous functioning of any two of these glands".

4.1.2 Instructions to Students:

1. Consult suitable books to collect relevant information and draw labelled diagrams as desired.
2. Present the data in a tabular form mentioning the following:
 - Serial Number,
 - Name of the endocrine gland,
 - Location in the body,
 - Name of the hormone(s) secreted,
 - Functions of the hormone.
3. Analyse the data to report which glands are not common in both; male and female.
4. Mention abnormalities caused by anomalous functioning of any two endocrine glands.
5. Develop and submit the report within a period of 2 weeks.

5.0 GENERAL SCHEME OF EVALUATION:

A student's performance may be judged using the following criteria:

<u>CRITERIA</u>	<u>WEIGHTAGE</u>
1. Collection of adequate and appropriate Information	30%

(2.9)

<u>CRITERIA</u>	<u>WEIGHTAGE</u>
2. Collection and display of materials	
OR	
Presentation of diagrams, tables, flow-charts, graphs, etc.	30%
3. <u>Reporting:</u>	
(i) Use of appropriate format including references.	20%
(2) Organisation and expression.	20%

The teacher will evaluate the student's performance as per the criteria outlined by him/her. The above criteria are evolved to help them in this task.

PUPIL'S REPORT OF THE PROJECT1.0 TITLE OF THE PROJECT

" Collection, display and compilation of data on 15 edible seeds/grains giving (1) scientific names of the plant, (2) the number of seed-leaves (cotyledons) (3) the major food-stuff stored in each, and (4) the season of cultivation."

2.0 INTRODUCTION: NEED AND IMPORTANCE OF THE STUDY.

Science and Technology have helped man to grow various types of crops for various purposes. The entire crop plant and its part, such as roots, stems, leaves, flowers, seeds, etc. are used by man in various ways. For this study such locally available seeds and grains have been collected and studied which are commonly used by man as food. The study helps in knowing locally cultivated crops for food as well as those food crops whose seeds/grains are brought to our locality. Besides this, we have learnt about the season of cultivation, nutritional value (primarily the type of food-stuff stored), and main uses of these seeds and grains. This project has also been useful in learning the techniques of collection, preservation, documentation, labelling and display of collected seeds as well as the method of recording our field-observations, collecting relevant data from the books and developing the present report. The display of collected seeds/grains along with the data presented is educative to both students and

(3.2)

the general public.

3.0 INECRY

...ultivates plants for obtaining useful products. The flowering plants, such as wheat and gram provide us seeds and grains which we use as our food. The food content of such seeds/grains may be starch, protein, oil, minerals and vitamins which are the major constituents of food. Usually seeds or grains are identified as rich in one type of food-stuff e.g., starch or oil though they may also contain other types of food-stuffs in sufficient quantities. For example, maize grains are usually identified as rich in starch, though they also contain protein as well as oil. Similarly mustard seeds are classified as good source of oil though they also contain protein.

The local or common names of plants vary from place to place and so scientists have given them botanical names which remain the same throughout the world. Each botanical name consists of two parts, the first part is called "generic name" while the second part is said "specific epithet". There may be several plants having a common generic name but with a different specific epithet. For example, (black gram) Urd, mung (green gram) and moth are three different crop plants having the same generic name 'Vigna'. But they differ in their specific epithets.

UrdVigna radiata

(3.3)

Mung .. Vigna auriculata

Moth .. Vigna aconitifolia

... flowering plants which bear seeds enclosed in fruits are classified as "Angiosperms". These plants are further classified as Monocotyledons and Dicotyledons on the basis of number of seed leaves (cotyledons) in their seeds. Majority of cereals belong to monocotyledonous plants. Their seeds are fused with the fruit and so they are better known as grains instead of seeds. Wheat, maize, bajra and rice are examples of grains. On the other hand, dicotyledonous seeds are not fused with the fruit but they remain inside the fruit. Groundnut, gram, mung, urd and mustard are examples of dicotyledonous seeds. We do not call them grains.

There are two major seasons for growing crops in India. Certain crops are sown in the beginning of the rainy season i.e. in July. Such crops are usually called the 'Summer crops (or Kharif crops). On the other hand, crops grown during October to April are usually classified as winter (or Rabi) crops. Mostly crops require only one season but certain crops are sown during the rainy season and are harvested during or after the winter season, e.g., arhar. Such crops are normally classified as winter crops due to having flowering season in winter. However, there are certain crops which can be grown several times during a year because they need much shorter life span and also do not need winter season for flowering. Such crops are 'all season crops' e.g. sunflower.

(3.4)

4.0 METHODS AND MATERIALS

We a group of 4 students planned to visit local crop fields, kitchen gardens and grain-shops in the market. The materials required for collection and preservation of the seeds were procured from the school laboratory. We collected several types of seeds/grains and also recorded information about the area and season of their cultivation. With the help of our teacher we observed the number of cotyledons present in each type.

We also consulted books in our school library to gather data about the nutritional value (primarily the type of good-stuffs stored in the seed/grain), main uses and also to verify their growing season and number of seed-leaves in them.

The material collected was dried and disinfected with the help of appropriate insecticides. i.e. D.D.T. It was then placed in polythene bags with naphthalene balls as preservative. In this way, materials for display in the polythene bags were prepared. These bags were arranged on a display board where along side each material complete information about common or local name of the seed/grain, its botanical name and number of seed-leaves, season of cultivation, nutritional value, main uses, date of collection and source of collection.

5.0 COLLECTION OF DATA AND ITS ANALYSIS AND INTERPRETATION

Fifteen different seeds/grains were collected which are displayed on two display boards. The data gathered are presented

(3.5)

in Table No. 1 which provides the following information about each type of seed/grain:

1. Common name,
2. Botanical name,
3. Number of Seed-leave (cotyledons),
4. Major Food-stuff,
5. Source of Collection,
6. Season of Cultivation, and
7. Main uses.

The data so obtained was also analysed to classify the seeds on the basis of (1) crop of winter or summer season, (2) number of cotyledons and (3) the type of food-stuffs.

6.0 RESULTS AND CONCLUSIONS

The crops presented in the table are classified into 'Summer crops and Winter crops' on the basis of "seasons of cultivations" with the exception of Sunflower crop. The winter crops are usually sown in October-November and harvested in March-April. On this basis, wheat (gehun) gram (chana), arhar (Pigeon-pea), mustard (sarson), Masur (lentil), zeera (cumin) and sonf (funnel) are winter crops.

The Summer crops are usually sown in rainy season, i.e. during July and harvested usually by October. Some of the crops take more time for maturation and so harvested late in winter.

3.6

TABLE L₁. DATA ABOUT LOCALLY AVAILABLE SEEDS/GRAINS

Sl. No.	Local/ Common Name	Scientific Name	No. of Seed, Leaf	Major Food Stuff.	Source of collection	Season of cultivation	Main use
1.	Wheat	<u>Triticum aestivum</u>	One	starch	field	winter	Bread/chapati
2.	Rice	<u>Oryza Sativa</u>	one	starch	Market	Summer	Bhat
3.	Gram	<u>Cicer arietinum</u>	two	protein	Field	winter	pulse/Bread
4.	Athar	<u>Cajanus cajan</u>	two	protein	Field	winter	pulse
5.	Groundnut	<u>Arachis hypogaea</u>	two	oil	Market	Summer	cil, food
6.	Maize	<u>Zea Mays</u>	one	starch	Market	Summer	Bread
7.	Mustard	<u>Brassica campestris</u>	two	cil	Field	winter	Oil
8.	Urd	<u>Vigna radiata</u>	two	protein	Market	Summer	pulse
9.	Mung	<u>Vigna auriculata</u>	two	protein	Market	Summer	pulse
10.	Moth	<u>Vigna acutifolia</u>	two	protein	Market	Summer	pulse
11.	Bajra	<u>Pennisetum americanum</u>	one	Starch	Market	Summer	Bread
12.	Lentil	<u>Lens esculenta</u>	two	Protein	Market	Winter	pulse
13.	Sunflower	<u>Helianthus annuus</u>	two	cil	Field	All Seasons	Cil
14.	Cumio(Zeera)	<u>Cuminum cyminum</u>	two	Minerals	Market	Winter	Spices
15.	Fennel(Sonf)	<u>Foeniculum vulgare</u>	two	Minerals	Market	Winter	spices

(3.7)

Paddy (or rice), maize (Makai), bajra (Pearl millet), groundnut, Arhar (pigeon pea), urd, mung and moth are usually said summer crops.

Sunflower crop is an "all season crop" as it can be grown in any season.

The seeds and grains shown in the table contain either one or two seed-leaves (or cotyledons). The seeds with one cotyledon are called monocotyledonous seeds while those with two cotyledons are termed dicotyledonous seeds. On this basis these fifteen seeds and grains are classified as shown in Table No. 2.

TABLE 2: MONOCOTYLEDONOUS AND DICOTYLEDONOUS SEEDS

Monocotyledonous Seed	Dicotyledonous Seeds
1. Wheat	Gram, arhar,
2. Rice	groundnut, mustard,
3. Maize	Urd, mung, moth,
4. Bajra	Lentil, sunflower, cumin, and fennel.

The data presented here shows that the cereals contain only one cotyledon in their seeds while those of pulses and oil-seeds have two cotyledons.

The seeds and grains collected here are classified into four categories on the basis of food-stuffs stored in them.

- i) Starchy seeds: Weat, rice, maize and bajra
- ii) Seeds with: Gram, arhar, urd, mung, Proteins moth and lentil

(3.8)

(iii) oil seeds:	Groundnut, mustard and sun flower
seeds with millets (Spices)	Cumin and fennel

Six of the seeds contain two or more types of food-stuffs in quite good quantities and are consumed by man for both purposes. For example, groundnut seeds are used for getting both protein and oil. Similarly maize is a very good source for starch and protein. It, in fact, also contains oil.

7.0 PRECAUTIONS AND LIMITATIONS

While collecting/procuring seeds and grains the following precautions were observed.

(i) Sufficient quantity of the material was obtained for the purpose of display.

(2) At the time of collection, permission from the owner was obtained.

(3) The material was air-dried and got dis-infected appropriately before arranging the display.

(4) Adequate information about each material was obtained from the farmers/owner of the shop.

(5) The information obtained from the farmers/shop owners were further supplemented from the textbooks.

(3,9)

8.0 REFERENCE BOOKS

Foster, H.S. and O. Tippo (1949). College Botany; Henry Hall & Co., New York.

Biology: A textbook for Senior Secondary Schools for class XI; Part II (1989); N.C.E.R.T., New Delhi-110016

Biology: A Textbook for Senior Secondary Schools for class XII, Part I (1989), N.C.E.R.T., New Delhi-110016

Dutta, A.C. (1983), College Botany, Oxford University Press

.....

PUPIL'S REPORT OF THE ASSIGNMENT

The pupil who has been allotted this assignment is supposed to submit his report along with the diagrams. The various aspects of the report are presented here so as to guide pupils how to write reports for their assignments. Teachers may also guide their students how to develop reports. However, they may develop their own formats for presenting reports by the students. This is only as an example.

The report presented here is written as if a student has worked on an assignment and submitted his/her report to his/her teacher. The teacher has also assessed the performance of his/her pupil and assigned marks.

1.0 TITLE OF THE ASSIGNMENT:

" Draw and label various endocrine glands in a human male and a human female and make a detailed study of them to report location of these glands, hormones secreted and their functions in a tabular form. Collect information about the abnormalities caused by anomalous functioning of any two of these glands."

2.0 NEED AND IMPORTANCE OF THE ASSIGNMENT:

The assignment is useful in knowing the various endocrine glands in man and woman, specially their location, hormones secreted, role of hormones in the normal functioning of our body and effects of improperly functioning hormones. This helps us understand the role of hormones and their glands secreting them.

and also in identifying the causes of certain abnormalities.

3.0 METHOD EMPLOYED:

"With the help of two books, two labelled diagrams have been drawn showing the location of various endocrine glands in human male and human female. In all, eight types of glands are shown in each of the two diagrams.

A detailed study was then made to collect data about the hormones secreted by these duct-less glands and their role in control and coordination. For this purpose, the data collected from books was presented in a table so that the location of the respective glands, names of hormones secreted by them, role of each hormone and other relevant information about them, if any, become apparent.

Data regarding two abnormally functioning glands and their harmful effect on our body have also been collected and presented.

4.0 COLLECTION, ANALYSIS AND INTERPRETATION OF DATA

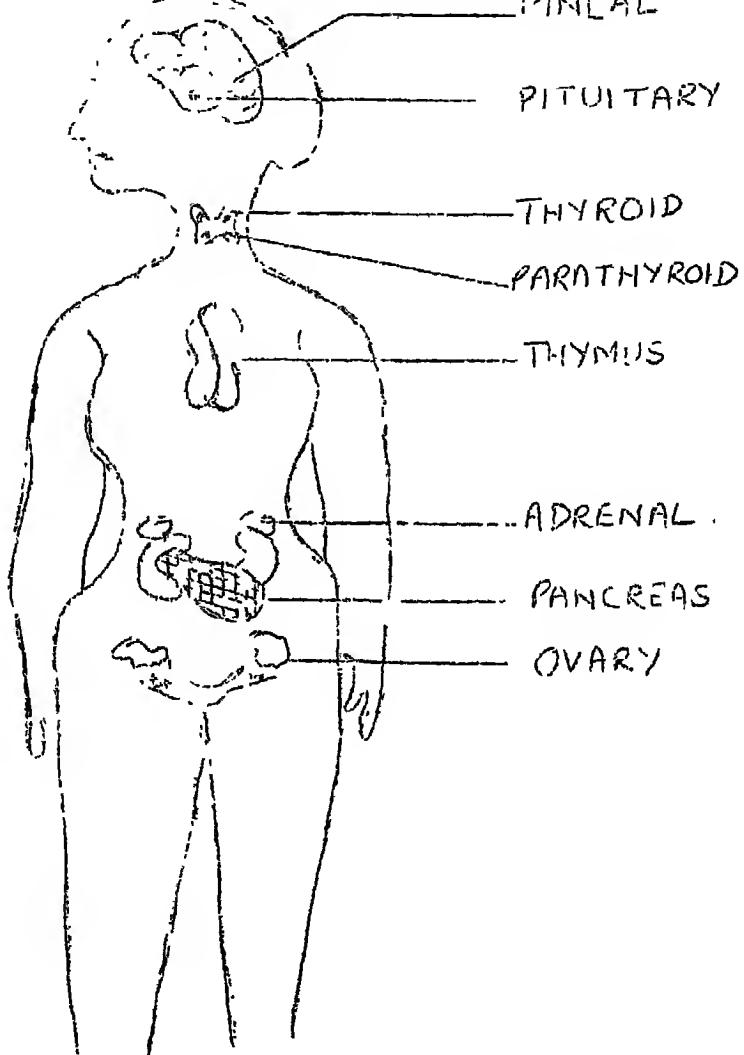
The data collected from different sources was verified and then presented in a tabular form having the following columns:

1. Serial Number,
2. Name of the Endocrine Gland,
3. Location of the gland,
4. Name of the hormone (s) secreted
5. Functions of individual hormones.

(4.3)

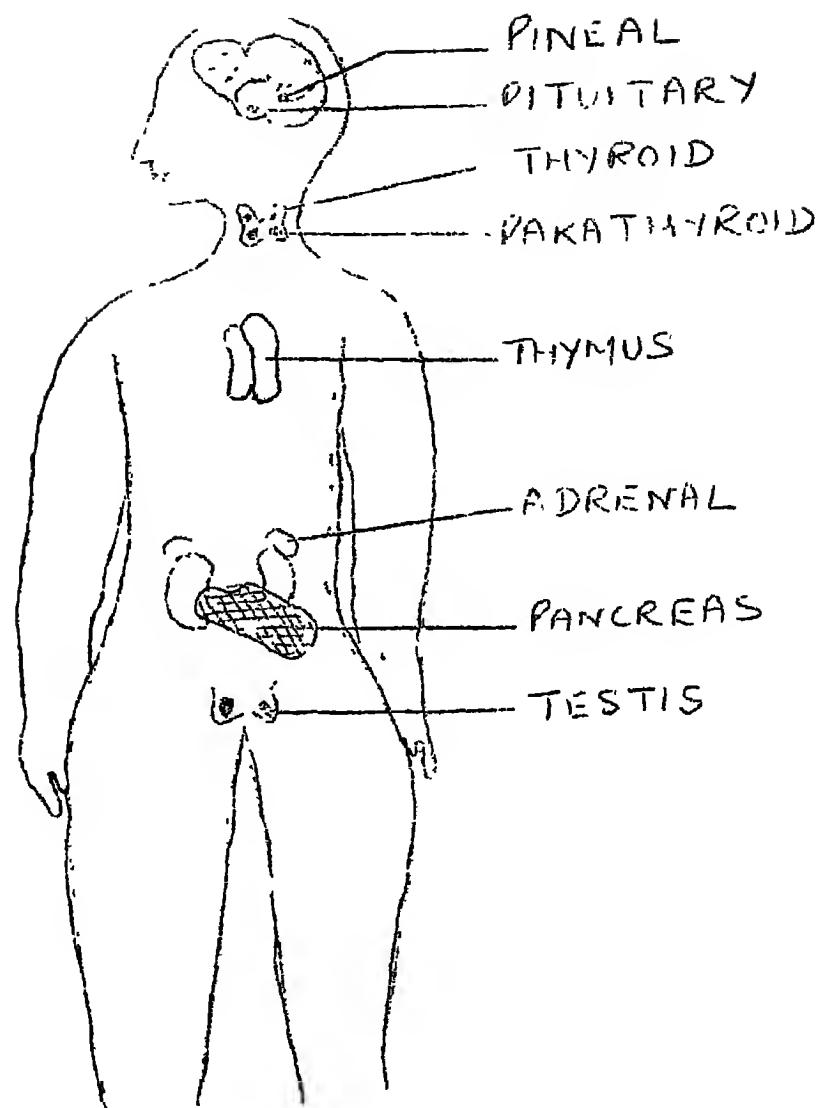
This data has been presented in Table 1. The figure 1 and 2 illustrate the exact location of the various endocrine glands in Human Female and Human Male respectively.

A comparative study of these hormones reveal that the human female ~~can~~ secretes two hormones, i.e., Estrogen and progesterone. Estrogen is primarily concerned with the development of female sex organs and also with the development of external ~~SEXUAL~~



LOCATION OF VARIOUS ENDOCRINE
GLANDS IN FEMALE (HUMAN)

4.4



LOCATION OF VARIOUS ENDOCRINE
GLANDS IN MALE (HUMAN)

(4.5)

TABLE 1: DATA ABOUT ENDOCRINE GLANDS OF HUMAN MALE AND FEMALE

Sl. No.	Name of Endocrine Gland	Location in the Body	Name of the Hormone	Functions of the Hormone
1.	Thyroid	Neck	1. Thyroxine	Regulates the rate of growth and metabolism.
			2. Calcitonin	Regulates blood calcium.
2.	Parathyroid	Neck	Parathormone (PTH)	Regulates the calcium level in the blood
3.	Pancreas	Near duodenum	Insulin	Regulates sugar metabolism
4.	Adrenal cortex	Above kidneys	1. Cortisone 2. Aldosterone	Helps in conversion of proteins to sugar Regulates the metabolism of sodium and potassium
5.	Hypothalamus	Brain	1. Thyrotropin releasing hormone	Regulates thyrotropin secretion. Regulates corticotropin secretion.
*3.	Gonadotropin releasing hormone.		2. Corticotropin releasing hormone	Regulates secretion of pituitary gonadotropins.
			3*	
6.	Pituitary	Brain	1. Thyrotropin (TSH) 2. FSH 3. ACTH 4. ADH	Stimulates Thyroids for Thyroxine Secretion, Stimulates Ovary to secrete estrogen. Stimulates adrenal cortex to make cortisone Controls the amount of water reabsorbed by the kidney.

(4.6)

		5. GH	Regulates tissue and bone growth
7. Ovary	Lower Abdomen in human female	1. Estrogen	Regulates development of female secondary sex organs and external sex characters.
		2. Progesterone	Controls pregnancy changes in female sex organs.
8. Testis	Extra abdominal Region in human male	Testosterone	Controls the development of male secondary sex organs and external sex characters.

characters, like the development of breasts. Progesterone regulates pregnancy changes in the female sex organs. There is one more hormone secreted by the pituitary gland of human female, i.e., Follicle Stimulating Hormone (FSH) which stimulates Ovary to secrete estrogen.

The human males do not produce estrogen, progesterone and FSH. Instead, testis located in the extra abdominal region produces testosterone hormone. It controls the development of male secondary sex organs as well as external masculine features such as the growth of moustaches and beard. The difference in the production of hormones in human males and females makes them different in external appearance due to the development of different secondary sexual characters like development of beard and moustaches in man and the

(4.7)

development of breasts in the woman on maturity.

The production of other hormones in human males and females is the same.

ABNORMALITIES PRODUCED BY ANAMOLOUS FUNCTIONING OF THYROID AND PANCREAS:

If thyroid gland fails to secrete thyroid hormones in an infant, the child's body growth slows down and mental development does not take place normally. As a result the child remains physically stunted and mentally retarded. His/her body temperature, heart beat and blood pressure also remain lower than normal. The patient develops the disease called cretinism.

Deficiency of thyroid hormone in adults produces Myxedema due to which the patient has a puffy appearance and lacks alertness, intelligence and initiative. Usually due to iodine deficiency thyroid enlarges (development of goitre) accompanied by cretinism and myxedema.

When Pancreas fails to produce insulin in sufficient quantity, it develops "Diabetes Mellitus" which means that the level of blood sugar becomes abnormally high exceeding the renal threshold for glucose, consequently glucose appears in the urine. As a result of this disease the wounds healing is delayed. Cholesterol level in the blood of the patient rises, thirst also increases due to increase in the volume of urine. In extreme cases, the patient suffers from coma and may die. However, administration of insulin reduces the blood sugar and checks the disease for some time.

(4.8)

5.0 SUMMARY AND CONCLUSIONS:

Human males and females have similar endocrine gland, and secrete the same hormones except those related with the development of sex organs in them and also the appearance of the masculine and feminine features at maturity.

The deficiency in the production in any of these hormones develop deficiency symptoms as stated in case of thyroid and pancreatic hormones.

6.0 BIBLIOGRAPHY:

Biological Science Curriculum Study (BSCS), 1980

Biological Science: An Inquiry into Life,

Harcourt Brace, New York.

Biology: A Textbook for Senior Secondary Classes (Class XII:

Part I), 1989, NCERT, New Delhi 110016.

Ganguly, B., A Sinha, and S. Adhikari (2nd Ed.), 1984. Introduction to Biology of Animals, Central Educational Enterprises, Calcutta

Hurkacz, P.C. and P.N. Mathur, 1976. A Textbook of Animal Physiology. S. Chand and Co., (Pvt.) Ltd., New Delhi.

Science: A Textbook for Class IX (Part II), 1988

NCERT, New Delhi-110016

William, J., 1987. Endocrinology (2nd ed.), McGraw - Hill, New York

OBJECTIVE BASED TEST ITEMS

Objective based questions of various forms are given here which may be used in preparing test papers for the over-book examination. The 'scoring key and marking scheme' has been provided in chapter VI and the 'Question-wise Analysis in chapter VII. Teachers may also enrich this material by constructing questions for this purposes

Q.1 Which of the following notations would be most appropriate on changing one neutron of $^{18}_{\text{X}}\text{N}$ into a proton?

- (1) $^{18}_{\text{X}}\text{7}$
- (2) $^{18}_{\text{X}}\text{9}$
- (3) $^{17}_{\text{X}}\text{8}^{\text{8}}$
- (4) $^{19}_{\text{X}}\text{8}$

Q.2 The weights of hydrogen and oxygen always remain in the same proportion in water irrespective of its source because its ~~one~~ molecule is always formed by combining.

- (1) One molecule of hydrogen with two molecules of oxygen.
- (2) Two molecules of hydrogen with one molecule of oxygen.
- (3) Two atoms of hydrogen with one atom of oxygen.
- (4) One atom of hydrogen with two atoms of oxygen.

(5.2)

Q.3 Which of the following is used for the rays that travel in straight line, could be bent by an electric/magnetic fields and bears positive charge?

- (1) Beta rays
- (2) Gamma rays
- (3) Alpha rays
- (4) X-rays

Q.4 In an experiment when alpha-particles were allowed to fall on a thin gold foil, most of the particles went straight through the foil except a very few, which almost bounced back. Which of the following hypotheses does it support?

- (1) There is a heavy nucleus of negatively charged particles in the centre surrounded by protons.
- (2) There is a tiny heavy nucleus of certain particles in the centre surrounded by electrons.
- (3) There is a tiny heavy nucleus of positively charged particles in the centre surrounded by protons.
- (4) There is a tiny but almost weightless nucleus of charged particles in the centre surrounded by electrons.

Q.5 Which of the following notations represents the arrangement of electrons in shells of an element having atomic number 20.

- (1) 2,8,8,2

(5.3)

(2) 2,2,8,8

(3) 2,8,2,8

(4) 8,2,8,2

Q.6 In a singly positive ion of an element of group first, the electrons are arranged in two shells. To which period should this element belong?

1. First

3. Third

2. Second

4. Fourth

Q.7 An element is placed in the sixth group of the third period in the periodic table. What is its valence?

1. 1

3. 3

2. 2

4. 6

Q.8 Which of the following features is common in the electronic configuration of the elements placed in the second group of the modern periodic table?

(1) Number of valence electrons

(2) Number of electron shells

(3) Number of protons in the nucleus

(4) Number of neutrons in the nucleus

Q.9 Amongst Ba, Ba⁺ and Ba⁺⁺, the most stable configuration is that of Ba⁺⁺ because

(1) it does not possess negative charge.

(2) it possesses positive charge.

(3) its outer electron shell has no electrons.

(4) its outer most electron shell is completely filled.

(5,4)

Q. 10 Which one of the following would be the least stable electronic configuration?

Q.11 The difference in reactivity of Na and Na^+ is due to the difference in their

(1) charge	(3) atomic mass.
(2) valence	(4) atomic number

Q. 12 Usually ionic compounds dissolve well in water because water.

- (1) weakens the electrical attraction between the ions.
- (2) weakens the electron sharing between atoms.
- (3) strengthens the electrical attraction between the ions.
- (4) strengthens the electron sharing between atoms.

Q.13 Two elements having electronic configuration (2,4) and (2,8,7) react to form a covalent compound. How many covalent bonds would it have?

Q.14 In the case of KCL, formula mass is usually used in place of molecular mass because.

- (1) its molecular mass is negligible.
- (2) it is a covalent compound.
- (3) there exists a discrete molecule.
- (4) there is no discrete molecule.

(5.4) A

Q. 15 Mass of one atom of an element X is 5.14×10^{-23} g, which of the following would be its atomic mass?

(1) $5.14 / 5.023$ (3) 5.14×6.023
(2) $6.023 / 5.14$ (4) 5.14×50.23

Q. 16 Suppose a scientist has the following quantities of four elements:

i) 32 g sulphur (ii) 8 g Oxygen, (iii) 2 g hydrogen and, (iv) 60 g calcium.

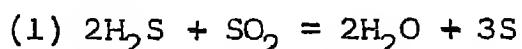
He wants to arrange them in an increasing order of the number of atoms present. Which of the following sequences is the most appropriate for this?

(1) (iii), (ii), (i), (iv)
(2) (iii), (ii), (iv), (i)
(3) (ii), (i), (iv), (iii)
(4) (ii), (i), (iii), (iv)

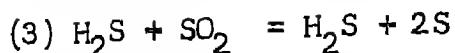
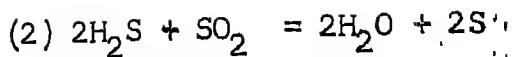
Q. 17 Which of the following examples presents the Avogadro Number?

(1) No. of Ca^{++} in 40 g $\text{Ca}(\text{OH})_2$
(2) No. of Ca^{++} in 74 g $\text{Ca}(\text{OH})_2$
(3) No. of OH^- in 74 g $\text{Ca}(\text{OH})_2$
(4) No. of OH^- in 34 g $\text{Ca}(\text{OH})_2$

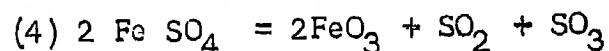
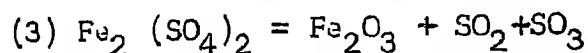
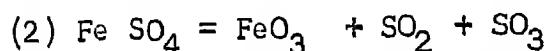
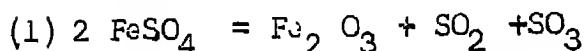
Q. 18 Hydrogen sulphide and sulphur dioxide react to form sulphur and water. A balanced chemical equation of this reaction is



(5.5)



Q.19. On heating ferrous sulphate crystals, ferric oxide is formed with the release of SO_2 and SO_3 . Which of the following equations shows this reaction correctly?



Q.20 Which one is the correct decreasing order of reactivity amongst the four metals: magnesium, mercury, zinc and copper?

(1) Magnesium, Mercury, Zinc, Copper

(2) Magnesium, Zinc, Copper, mercury

(3) Magnesium, Copper, mercury, zinc

(4) Magnesium, Zinc, mercury, Copper

Q.21 A person starting from a place 'A' moves 100 m towards west on a straight road, and then walks back 60 m on the same road. What is the displacement of the person from his starting place A?

1. 40 m west

2. 40 m east

3. 60 m west

4. 60 m east

(5.6)

Q.22 A body starts rotating in a circle of radius 1 m with a constant speed of 2 m/s. What will be the displacement of the body after one second?

- (1) 0
- (2) 1 m
- (3) m
- (4) 2 m

Q. 23 Which of the following objects shows the highest speed?

- (1) A bicycle moving with a speed of 0.3 km/min
- (2) A fast runner running with a speed of 7m/s
- (3) A bee flying with a speed 240m/3 min.
- (4) A tractor moving with a speed of 0.008km/s

Q.24 A man walks at a uniform speed of 1.5 m/s. After 30 min. a cyclist starts to catch him with a uniform speed of 6m/s. What will be the time taken by the cyclist to catch him?

- 1. 5 min
- 2. 10 min
- 3. 15 min
- 4. 20 min

Q.25 to 29 are based on the following table, which shows the distance-time table of a moving car.

<u>Time</u>	<u>Distance</u>
10.10 a.m	0 km

(5.7)

<u>Time</u>	<u>Distance</u>
10.30 a.m.	5 km
10.45 a.m.	12 km
10.55 a.m.	22 km
11.05 a.m.	26 km
11.15 a.m.	28 km
11.30 a.m.	33 km
11.40 a.m.	40 km

Now answer question Nos. 25 to 29

Q.No. 25 When was the car travelling at the greatest speed?

- (1) during 10.30 a.m. to 10.45 a.m.
- (2) During 10.45 am to 10.55 a.m.
- (3) During 10.55 a.m. to 11.05 a.m.
- (4) During 10.30 a.m. to 11.40 a.m.

Q.No. 26 What was the average speed of the car?

- (1) 4.4. km/h
- (2) 22.5 km/h
- (3) 26.6 km/h
- (4) 44.4 km/h

Q. 27 After which distance does the car travel with a speed of 12 km/h?

- (1) 5 km
- (2) 26 km
- (3) 28 km
- (4) 38 km

(5.8)

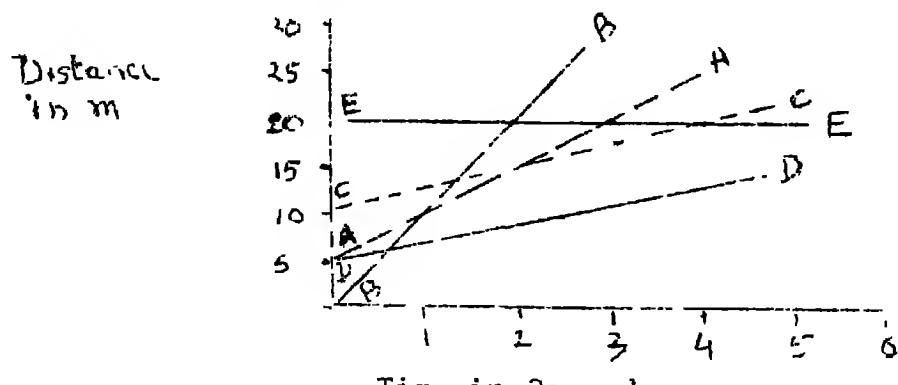
Q. 28 What was the speed between 10.30 a.m. and 10.45 a.m?

- (1) 05 km/h
- (2) 07 km/h
- (3) 20 km/h
- (4) 28 km/h

Q. 29 Which of the following conclusions is the most appropriate on the basis of data provided in this table?

- (1) Most of the time car moves with a speed of 40 km/h
- (2) The car moves with a uniform speed of 27 km/h
- (3) The car moves unequal distances in equal intervals of time.
- (4) The car moves equal distances in equal intervals of time.

Question Numbers 30 to 35 are based on the distance-time graph of five bodies - A, B, C, D and E.



Distance - time Graph

Study the graph to answer these questions.

(5.9)

Q. 30 Which of the bodies is travelling fastest?

(1) A (2) B (3) C (4) E

Q. 31 Which of the bodies is not moving at all?

(1) A (2) B (3) D (4) E

Q. 32 Which of the straight lines corresponds to a uniform speed of 5 m/s?

(1) AA (2) BB (3) CC (4) DD

Q. 33 Which of the bodies travels a distance of 10 m in 4 s?

(1) A (2) C (3) D (4) E

Q. 34 When B passes A, where was C?

(1) Lying behind B by 2.5 m
(2) Lying behind B by 5 m
(3) Moving ahead of B by 2.5 m
(4) moving ahead of B by 5 m

Q. 35 How much time A takes to pass C?

(1) 1 s (2) 2 s (3) 3 s (4) 4 s

Q. 36 When a graph of the weight against age of man is plotted, it is always like a curve instead of a straight line. What does it indicate?

(1) Man always increases in weight with age uniformly.
(2) Man does not increase in weight with age uniformly.
(3) Man increases in weight with age uniformly during the first few years.
(4) Man increases in weight with age uniformly after attaining an age of 20 years.

(5,10)

Q. 37 An athlete runs on a circular track covering equal distance in equal intervals of time. Which of the following changes in his speed and velocity occur during this motion?

- (1) Speed remains constant and hence velocity is also constant.
- (2) Speed always changes and hence velocity also changes.
- (3) Speed changes but the velocity remains constant.
- (4) Speed remains constant but velocity changes.

Q. 38 In a vertical circular mechanised carnival after two rotations from the start, the average speed.

- (1.) remains constant throughout and so also is its velocity.
- (2) Changes continuously but the speed remains constant throughout.
- (3) remains constant throughout but its velocity changes continuously.
- (4) changes continuously and so also the velocity changes.

Q. 39. Four children are sitting at the corners of a table of 4×2 m size. They start playing by throwing a ball successively to one another. In doing so speed along any two adjacent sides is.

- (1) the same as its velocity along the same adjacent side.

(5.11)

- (2) the same as its velocity is along the other two adjacent sides.
- (3) different from its velocity along the other two adjacent sides.
- (4) opposite to its velocity along the same adjacent side.

Q.41 Mohan tries to displace a table but fails. The same table is displaced by Susan. This is because the inertia of the table is

- (1) less for Mohan but more for Susan.
- (2) more for Mohan but less for Susan
- (3) the same for both but Mohan applies more force.
- (4) the same for both but Susan applies more force.

Q. 42 An object starts from rest and attains a velocity of ' v ' with an acceleration ' s ' in time ' t '. Another object starts with a velocity ' u ' ($u < v$) and same acceleration ' a ' to attain the same velocity ' v '. Time ' t_2 ' to attain this velocity is such that

(1) $t_2 = 0$
 (2) $t_2 = t_1$
 (3) $t_2 = -t_1$
 (4) $t_2 = t_1$

(5.12)

Q. 43 Up to what height would a glass ball travel in a bowl, if it is allowed to fall in the bowl from its rim?

- (1) up to the centre of the bottom and returns back.
- (2) up to the other side of the rim and returns back.
- (3) up to the other side of the rim and stays there.
- (4) up to the centre of the bottom and stays there.

Q. 44 When an object is placed at the upper end of an inclined plane, it begins to move down with acceleration, because of

- (1) the force of gravity with an acceleration less than g.
- (2) the force of gravity with an acceleration more than g.
- (3) the force of friction with an acceleration more than g.
- (4) the force of friction with an acceleration less than g.

Q. 45 An aeroplane takes off from the run-way at a speed of 80 m/s. Which of the following quantities represents the length of the run-way required to acquire this speed in 10 s with a uniform acceleration of 8 m/s^2 .

- (1) 200 m
- (3) 400 m
- (2) 300 m
- (4) 500 m

Q. 46 A glass ball of mass 25 g moving with a velocity of 2 m/s enters into mud and is brought to rest in 5 cm. What is the retarding force applied by the mud?

- (1) 10 N
- (3) 1N

(5.13)

(2) 5 N (4) .5 N

Q. 47 A cyclist is going on the road with a speed of 8 km/h.

Suddenly he finds that oil is spread on the road but he continues to paddle his bicycle at the same rate. The speed of his bicycle would

- (1) increase due to a decrease in friction.
- (2) increases due to an increase in friction.
- (3) decrease due to an increase in friction.
- (4) decrease due to a decrease in friction.

Q. 48 Which of the following quantities presents the acceleration produced by a force of 12 N exerted on an object of mass 3 kg?

(1) 36 m/s ²	(3) 04 m/s ²
(2) 08m/s ²	(4) 0.25 m/s ²

Q.49 The force of gravitation between two bodies does not depend on the

- (1) distance between them.
- (2) product of their masses.
- (3) product of their weights
- (4) constant G.

Q.50 A stone when released from the hand, it falls downward due to gravitational force of the earth. But the stone also attracts the earth with an equal force according to Newton's third law.

(5.14)

Why then should the stone fall on the earth? Because

- (1) greater acceleration is produced on the stone.
- (2) greater acceleration is produced on the earth.
- (3) less acceleration is produced on the stone.
- (4) Newton's third law of motion is not applicable here.

Q.51 How much distance an object will cover in a second after it had been let fall for 500m from the top of a cliff?

- (1) 605 m
- (2) 505 m
- (3) 500 m
- (4) 105 m

Q.52 When two balls of the same mass but one made of cotton and the other of iron, are dropped from the same height, the iron-ball hits the ground earlier than the cotton-ball. Which of the following explanations offers the most appropriate reason?

- (1) Heavier objects fall with greater speed than the lighter ones.
- (2) Gravitational force of the earth is more on the iron-ball than on the cotton ball.
- (3) Friction offered by the air is more on an object with a larger volume.

(5.15)

(4) Acceleration due to gravity is more on
an object with a larger volume.

Q. 53 Suppose a space ship is at a distance equal to two earth's
radii from the centre of the earth. What would be its
gravitational acceleration?

(1) 19.6 m/s^2
(2) 9.8 m/s^2
(3) 4.9 m/s^2
(4) 2.45 m/s^2

Q. 54 The weight of an object is defined as

- (1) the force with which it is attracted by the earth.
- (2) the force with which it hits the ground on falling
from a height.
- (3) the force with which it falls downward when dropped
from a height.
- (4) the force with which it attracts another object
having equal mass.

Q. 55 How should a body be moved away from the surface
of earth so that it weighs one-fourth of what it had
on the surface of the earth? A distance equal to

(1) half of the earth's radius.
(2) earth's radius
(3) twice the radius
(4) four times to the radius.

(5.16)

Q.56 The length of a string of a simple pendulum is increased by four times. The period of oscillation of the pendulum will become

- (1) four times.
- (2) doubled.
- (3) half.
- (4) one fourth.

Q. 57 Which of the following is the time-period of a simple pendulum whose length L is 2.45 m? ($g = 9.8 \text{ m/s}^2$ and $\pi = 3.14$).

- (1) 25.22 s
- (2) 12.56 s
- (3) 3.14 s
- (4) 1.57 s

Q.58 Which of the following quantities is the length of string of a simple pendulum, if its time-period is 4 s

- (1) 16 m
- (2) 8 m
- (3) 4 m
- (4) 2 m

Q.59 Which of the following is the length of a simple pendulum if its time-period is equal to 2 s? ($g = 9.8 \text{ m/s}^2$ and $\pi^2 = 9.8$)

- (1) 4 m
- (2) 2 m

(5.17)

(3) 1 m

(4) 0.5 m

Q.60 The bob of a simple pendulum oscillates from the extreme left position to the mean position and then from the mean position to the extreme right position, when once, it has been given a swing. Why does it not stop at the mean position?

(1) Because of the gravitational attraction of earth

(2) Because of having a certain velocity

(3) Because of the force exerted by the string

(4) Because of the force exerted by the wind.

Q.61 A 'Pulse' differs from a waves usually in involving oscillation of the medium

(1) for a long time.

(2) for a short time.

(3) with higher frequency.

(4) with lower frequency.

Q.62 Which of the following distances is equal to wave length?

(1) Distance between the crest and the nearest trough

(2) Distance between two consecutive troughs

(3) Distance travelled by a wave in one second

(4) Distance travelled by a wave in one minute.

Q.63 A wave with a wavelength of 0.2 m is moving by a velocity of 2 m/s. What is the time-period of this wave?

(1) 4 s

(2) 1 s

(3) .4 s

(4) .1 s

(5.17) A

Q. 64 The velocity of a wave is 1 m/s and its wavelength is 1 m . Which of the following would be its time-period?

- (1) 100 s
- (2) 10 s
- (3) 1 s
- (4) 0.1 s

Q. 65 The force F acting on a body of mass m moving in a circle of radius r is always perpendicular to the velocity v . The work done by the force will be

- (1) Fv
- (2) Fr
- (3) $F \cdot 2\pi r$
- (4) zero

Q. 66 When a stone is dropped from a height its (mechanical) energy

- (1) increases.
- (2) decreases.
- (3) remains the same.
- (4) is converted into potential energy.

Q. 67 When the speed of a moving object is doubled its

- (1) acceleration becomes four times.
- (2) weight becomes doubled.
- (3) kinetic energy becomes doubled.
- (4) kinetic energy becomes four times.

Q. 68 Work done in raising a box on a platform depends on

- (1) how fast it is raised.

(5, 18)

- (2) the strength of the person raising it.
- (3) the height to which it is raised.
- (4) none of the above.

Q. 69 Which of the following transfers of energy takes place when a ball is kicked by a player?

- (1) Player loses energy and the ball gains it.
- (2) Ball loses energy and the player gains it.
- (3) Player loses energy and ground gains it.
- (4) Ball loses energy and ground gains it.

Q. 70 An iron sphere of mass 30 kg has the same diameter as an aluminium sphere of 10.5 kg mass. The two spheres are dropped simultaneously from a cliff. When they are 10 m from the ground, they have the same

- (1) acceleration.
- (2) momentum.
- (3) potential energy.
- (4) kinetic energy.

Q. 71 A ring shaped piece of metal is heated. If the metal expands, the hole will

- (1) expand.
- (2) contract.
- (3) remain unchanged.
- (4) expand or contract depending on the ring.

(5.19)

Q. 72 When an object is heated the molecules that make up the object

- (1) lose energy
- (2) begin to move faster
- (3) become heavier
- (4) become lighter.

Q. 73 The temperature of a block of iron is 140°F . Its temperature on celsius scale is

- (1) 140°
- (2) 108°
- (3) 50°
- (4) 32°

Q. 74 In sunlight, an object appears blue, then in red light it will appear

- (1) Red.
- (2) Blue.
- (3) Black.
- (4) Green.

Q. 75 An object is placed at the distance of 30 cm in front of a concave mirror of focal length 15 cm. Its image will be formed as

- (a) real, inverted and at a distance of 15 cms.
- (b) real, inverted and at a distance of 30 cms.
- (c) virtual, erect and at a distance of 30 cms.
- (d) virtual, erect and at a distance of 15 cms.

(5.20)

Q. 76 Two resistances of 50 each are connected in series. The combination is joined to the terminals of a battery of 50 v. The potential difference across each resistance would be

- (1) 1 volt.
- (2) 50 volts.
- (3) 25 volts.
- (4) 2 volts.

Q. 77 A one hundred watt bulb is lighted for one hour. The electric energy consumed shall be

- (1) 100 watts.
- (2) 10 kilowatts
- (3) 100 kilowatts.
- (4) None of the above

Q. 78 Relationship between a tiger and a deer in a forest is an example of

- (1) Symbiosis.
- (2) Parasitism
- (3) Predation
- (4) Competition.

Q. 79 The camel increases its internal temperature from 37° to 41°C when the temperature of the outside atmosphere is as high as 45°C . This increase in its body temperature helps it in

- (1) reducing perspiration.
- (2) reducing breathing rhythm.
- (3) increasing breathing rhythm.
- (4) increasing perspiration.

(5.21)

Q. 80 Which of the following outcomes may result if we increase the number of tigers in a forest community?

- (1) The increased number of tigers would bring better balance in the community.
- (2) The undergrowth of the forest would start decreasing in mass.
- (3) The deer's population would start decreasing in number.
- (4) The forest trees would start decreasing in number.

Q. 81 Which one of the following effects of deforestation leads to floods?

- (1) Penetration of rain water into the soil with greater speed
- (2) Flow of rain water on the soil surface with higher force
- (3) Siltinj of the river bed
- (4) Extensive soil erosion

Q. 82 Suppose our government had provided some of the Bengal tigers to Govt. of another country. The authorities kept these tigers in Rocky mountains of their country. These tigers could not flourish and breed. This was primarily because they flourish only in

- (1) green land forests.
- (2) suitable climatic conditions
- (3) suitable biotic conditions.
- (4) a congenial environment.

(5.22)

Q. 83 Which of the following outcome is most likely if a fresh water fish is put in the sea?

- (1) It would be killed by waves.
- (2) It would be devoured by marine fishes.
- (3) It would lose water from its body and die.
- (4) It would face difficulty in swimming.

Q. 84 A house lady sprayed an insecticide in her house. All insects except a few mosquitoes were killed. After a month, she sprayed the same insecticide again. This time, the same type of mosquitoes survived more in number. She sprayed again on the following day, but these mosquitoes were not killed. Which of the following conclusions would you draw from this,

- (1) Insecticide-tolerant mosquitoes survived and increased in number.
- (2) Mosquitoes which escaped the insecticidal spray, produced insecticide-resistant progeny.
- (3) The insecticide used was defective as it did not kill all mosquitoes effectively.
- (4) The house lady did not spray the insecticide properly and so the mosquitoes survived.

Q. 85 Why do man survive in different habitats successfully?

- (1) They can domesticate wild animals according to their needs.
- (2) They can manipulate their habitats to suit their needs.

(5.23)

(3) They can grow all types of crops to obtain food and textiles.

(4) They can eliminate powerful animals like tigers successfully.

Q.86 Habitat of an organism is defined as its natural environment which consists of

(1) living organisms, like plants and animals.

(2) physical conditions and living organisms.

(3) geographical conditions of rain fall and temperature.

(4) tropical forests of south India, Malaya and Indonesia.

Q.87 Tropical forest are rich in diverse biota, because they provide

(1) adequate food.

(2) good protection

(3) varied microhabitats

(4) large water reservoir.

Q. 88 Which of the following habitats should have usually the highest number of ecological niches?

(1) Fresh water lake surrounded by rice fields

(2) Open sandy sea beach

(3) Small town with green vegetation

(4) Thick evergreen forest with large canopies

Q. 89. A small town with bushes and trees usually possesses larger number of species of birds than those in a thick evergreen forest due to offering

(5.24)

- (1) bushes and trees for housing large populations of a few species of birds.
- (2) large uniformly close canopies of trees for the safety of birds.
- (3) a wider variety of habitats for different types of birds.
- (4) a larger variety of fruits for providing food for the birds.

Q.90 A group of students visited a locality several times to find-out how many different kinds of birds live there. They located all kinds of birds except a few. Which of the following reasons accounts for it most appropriately?

- (1) Certain kinds of birds run very fast.
- (2) certain kinds of birds fly very high.
- (3) certain kinds of birds hide in the bushes.
- (4) certain kinds of birds merge with the surroundings.

Q. 91 Which of the following sets of birds possesses long straight beaks?

- (1) Egret, sunbird and king-fisher
- (2) kingfisher, house crow and bee-eater
- (3) House crow, egret and kingfisher
- (4) Bee-eater, sunbird and house crow

(5.25)

Q. 92 The female house-sparrow is distinguished from that of the male by having a

- (1) paler brown backs and grey heads.
- (2) paler brown backs and paler brown heads.
- (3) reddish brown backs and black beard like patch from chin to breast.
- (4) paler brown heads and black beard like patch from chin to breast.

Q. 93 A group of five students investigated that 21 kinds of birds are present in winter season of a particular habitat. Another group of six students found that there are 22 kinds of birds existing in winter season of another habitat. Which one of the following conclusions is most appropriate on the basis of this data?

- (1) The two habitats have different kinds of birds.
- (2) The two habitats have several different ecological niches.
- (3) The two habitats differ widely from each other in the types of ecological niches.
- (4) The former habitat provides fewer ways of making a living than the other one.

Q. 94 A student observed a white leg horn hen and a black

(5.26)

minorcha cock along with their two chicken in a poultry. The adults represent.

- (1) members of two different communities
- (2) members of two different populations of birds
- (3) male and female birds of two different species.
- (4) male and female birds of the same species.

Q. 95 Structurally pariah kite and barn owl are similar in having

- (1) strong curved beak and vicious claws.
- (2) vicious claws and binocular vision.
- (3) binocular vision and forked tail.
- (4) forked tail and long curved beak.

Q. 96 Which of the following birds roosts in large aggregation as well as nests in natural holes in trees for raising its own chicks?

- (1) House crow
- (2) Myna
- (3) Koel
- (4) Bulbul

Q. 97 Which one of the following groups represents organs of the same organ-system?

- (1) Lungs, pharynx, trachea and pancreas
- (2) Intestine, stomach, rectum and oesophagus

(5,26) A

(3) Mouth cavity, trachea, oesophagus and stomach

(4) Mouth cavity, pancreas, lungs and pharynx

Q. 93

Which one of the following ~~is~~ supports the statement, somatic cells ~~while~~ germ cells do not.

(1) Germ cells divide by meiosis to produce the first cell of the next generation.

(2) Somatic cells divide by mitosis to produce the first cell of the next generation.

(3) Somatic cells produce gametes which unite to produce the first cell of the next generation.

(4) Germ cells produce gametes which unite to produce next generation.

Q. 99

A woman gave birth to male triplets out of which two were identical. This situation is possible when

(1) two ova are fertilized, each one by a sperm.

(2) One ovum is fertilized by two sperms.

(3) Three ova are fertilized by two sperms.

(4) Three ova are fertilized by ~~one~~ sperms.

Q. 100

Genetic variation in the progeny is mainly brought about by which of the following events?

(1) Mitosis

(2) Meiosis

(3) Crossing-over.

(4) Translocation

101

An experiment to show O₂ evolution during photosynthesis

was set up. This apparatus was placed under a coloured jar. There was no evolution of bubbles that plants are not having photosynthesis. This may be due to

(1) Non-absorption of the coloured light by the leaves.

(5.27)

- (2) poor intensity of the coloured light available to the leaves.
- (3) availability of only red light to the leaves.
- (4) Non-availability of sufficient amount of CO_2 in water.

Q. 102 Green plants grown in an heavily air polluted industrial area for few days did not yield starch during photosynthetic experiments in spite of being supplied with CO_2 , H_2O and sun light. The possible causes are:

- A. More of SO_2 retarded the photosynthetic process
- B. High Concentration of CO_2
- C. Leaves covered by ~~soot~~
- D. Poisonous air wastes killing the chlorophyll.

The gaseous exchange has been prevented by

- (1) A and B
- (2) B and C
- (3) C and D
- (4) D and A

Q. 103 A tiger accomplishes the following order to get its nutrition: (A) Absorbs food in his blood stream,
(B) Eats other animals, (C) Breaks down macromolecules,
(D) Removes undigested food out of the body.

(5.28)

(1) A, B, C, D (3) B, C, A, D
(2) B, A, C, D (4) B, A, D, C

III. Q. 104.

sets of
Q. 104 Which of the following factors regulates the opening
of stomata needed for gaseous exchange and transpiration.

A. intensity of light
B. Loss of water from the plant surface
C. high turgor pressure in ^{the epidermal} cells.

(1) A and B
(2) B and C
(3) A and C
(4) C alone.

Q. 105 Which of the following processes is helped by transpiration?

(1) the movement of dissolved substances in plants both ways - upwards & downwards.
(2) the translocation of food made ^{in the} leaf to other parts of the plants
(3) movement of water and dissolved salts from the soil to travel upwards through xylem.
(4) transport of sugar and other substances through sieve tubes of plant.

Q. 106 Which of the following is the correct sequence of blood vessels coming out from heart and again going

(5.29)

back?

- A. Artery
- B. Veins
- C. Arterioles
- D. Venules
- E. Capillaries

- (1) A, C, E, D; B.
- (2) A, B, D, C, E.
- (3) A, C, D, B, E.
- (4) A, C, E, B, D.

Q. 107 Which of the following is the correct course of oxygenated blood in human body?

- A. Pulmonary vein B. ~~left~~ auricle
- C. Aorta D. ~~right~~ ventricle

- (1) A, D, C, B.
- (2) A, C, B, D.
- (3) A, B, D, C.
- (4) A, B, C, D.

Q. 108 A fish was caught and its mouth was sealed with cello tape and then left in water. It was found that the fish died after five minutes. It is because it could not

- (1) feed.
- (2) drink.
- (3) respire.
- (4) move.

(5. 430)

Q. 109 During surgery a surgeon clipped some blood vessels.

Supply of food materials is blocked when the

- (1) arteries are clipped.
- (2) Arteries are not clipped.
- (3) Veins are clipped.
- (4) Veins are open.

Q. 110 The increasing need of atmospheric O₂ due to population growth can be met with by - - - - -

- (1) checking the industrialisation.
- (2) checking the motor vehicle on road.
- (3) increasing the vegetation.
- (4) increasing the animal population.

Q. 111 To which of the following processes or translocations involved?

- (1) The movement of dissolved substances in plants both ways upwards and downwards
- (2) The translocation of food made in leaves to other parts of the plant
- (3) Movement of water and dissolved salt from the soil to travel upwards through xylem
- (4) Transport of sugar and other substances through sieve tubes of plant.

Q. 112. In a rainy season a student collected 'Spawn' i.e. fertilized ova from a pond. After few days they developed into larvae of frog. It is an example of

- (1) Development.

(5.31)

- (2) internal fertilization
- (3) external and internal fertilization
- (4) absence of fertilization.

Q. 113. A cycle rider takes a sudden turn around a sharp corner. Which part of the brain helps him in maintaining the balance?

- (1) Medulla oblongata
- (2) Mid-brain
- (3) Cerebellum
- (4) Cerebrum (Cerebral hemisphere)

Q. 114 In a motor accident a passenger was injured and lost his memory and consciousness. This was due to damage caused in region of

- (1) medulla oblongata.
- (2) Cerebellum.
- (3) Cerebral hemisphere.
- (4) optic lobes.

Q. 115 When seeds are sown in different positions in a field, their radicles always grow downward, i.e. towards the gravity, entering into the soil forming roots and their plumules usually grow upwards into the air. Which of the following substances, coordinates primarily these actions?

- (1) Enzymes
- (2) Auxins
- (3) Gibberellins
- (4) Stored proteins

(5.32)

Q. 116. A patient was advised by a doctor to take insulin tablets every day for a week. Which of the following substances should have been present in the urine of the patient for such an advice?

- (1) Albumin
- (2) Sugar
- (3) Cortisone
- (4) Cytokinin

Q. 117 If the root tip of a germinating seedling is decapitated, it

- (1) gives rise to new branches
- (2) grows very fast
- (3) stops growing further
- (4) bends towards light.

Q. 118 A farmer obtained a plant of his own choice with various characteristics which he wants to retain. In which one of the following methods he will NOT be able to control the characteristics of this plant?

- (1) Grafting
- (2) sexual reproduction
- (3) tissue culture
- (4) Layering

Q. 119 A farmer removes the anthers of a flower and covers its pistil by a polythene bag before it attains maturity. Which of the following results is most expected in this situation?

- (1) Viable but fewer seeds are formed.

(5.33)

- (2) The resulting Embryo does not survive
- (3) Seeds produced does not have seed coats.
- (4) Fruits and seeds are not formed.

Q. 120 Which of the following is the correct ascending order in relation to having highest brain/body ratio?

- (1) Man, elephant, rat
- (2) Rat, tiger, man
- (3) Camel, man, elephant
- (4) Cow, man, rat

Q. 121 The hands of the ape are larger than that of man because

- (1) ape lives on land
- (2) ape is a *Thomomys*.
- (3) apes balance on the knuckles of their hands while walking.
- (4) ape can balance itself on legs.

Q. 122 By which of the following, the rain-fall in a hilly region will be affected the most?

- (1) Soil erosion
- (2) Poultry development
- (3) Deforestation
- (4) Landslides

Q. 123 Which of the following was adopted earlier by primitive man?

- (1) Jute
- (2) Cotton
- (3) Silk
- (4) Wheat

(5.34)

Q. 124 Which of the following natural resource is NOT produced by insects?

- (1) Honey
- (2) Silk
- (3) Cotton
- (4) Wax

Q. 125 A student found several small outgrowths in the roots of a pea plant. He was told that it was due to a prokaryotic organism and is of usual occurrence. These out growth will

- (1) destroy the roots of the plant
- (2) help in increasing the soil fertility
- (3) develop Toxicity in pea seeds
- (4) destroy the leaves of the pea

Q. 126 When man had just invented to preserve the meat in the tins, which of the following latest way of transportation was available at that time?

- (1) Steam boat
- (2) Wooden boat
- (3) Motor car
- (4) Aeroplane

Q. 127 It was the period when the man just invented the drilling of petroleum. Which of the following means of communication was NOT developed by that time?

- (1) Telegraphy
- (2) Photography
- (3) Radio broadcasting
- (4) Printing press

(5,35)

128 Which of the following was NOT invente'd till the
end of second world war?

1. Diesel engine

2. Steam engine

3. Electric bulb

4. Transistors

SCORING KEY OF THE TEST ITEMS

Q. No.	Key						
1	(2)	29	(3)	57	(3)	85	(2)
2	(3)	30	(2)	58	(3)	86	(2)
3	(3)	31	(4)	59	(3)	87	(3)
4	(2)	32	(1)	60	(2)	88	(1)
5	(1)	33	(2)	61	(2)	89	(3)
6	(3)	34	(3)	62	(2)	90	(4)
7	(2)	35	(2)	63	(4)	91	(3)
8	(1)	36	(2)	64	(4)	92	(2)
9	(4)	37	(4)	65	(4)	93	(2)
10	(2)	38	(3)	66	(3)	94	(4)
11	(1)	39	(3)	67	(4)	95	(1)
12	(1)	40	(1)	68	(3)	96	(2)
13	(4)	41	(4)	69	(1)	97	(2)
14	(4)	42	(3)	70	(1)	98	(4)
15	(3)	43	(2)	71	(1)	99	(1)
16	(3)	44	(1)	72	(2)	100	(3)
17	(2)	45	(3)	73	(3)	101	(1)
18	(1)	46	(3)	74	(3)	102	(2)
19	(1)	47	(1)	75	(2)	103	(3)
20	(2)	48	(3)	76	(3)	104	(1)

(6,2)

21	(1)	49	(4)	77	(4)	105	(3)
22	(1)	50	(1)	78	(3)	106	(1)
23	(4)	51	(4)	79	(1)	107	(3)
24	(2)	52	(3)	80	(3)	108	(3)
25	(2)	53	(4)	81	(3)	109	(1)
26	(3)	54	(1)	82	(4)	110	(3)
27	(2)	55	(2)	83	(3)	111	(2)
28	(4)	56	(2)	84	(1)	112	(1)
					113	(3)	
					114	(3)	
					115	(2)	
					116	(2)	
					117	(3)	
					118	(2)	
					119	(4)	
					120	(2)	
					121	(3)	
					122	(3)	
					123	(4)	
					124	(3)	
					125	(2)	
					126	(1)	
					127	(3)	
					128	(4)	

QUESTION WISE ANALYSIS OF THE TEST ITEMS (MULTIPLE CHOICE)

S. No.	Objective	Specifi cations	Unit Num- ber	Form of Question	Marks allotted	Estimated Time (Minute)	Estimated Difficul- ty level
1	A	Predicts	1.3	MC	1	2	A
2	U	Transla- tes	1.1	MC	1	1	B
3	U	Compares	1.2	MC	1	1	B
4	A	Judges	1.2	MC	1	2	A
5	U	Interprets	1.2	MC	1	1	B
6	A	Analysis	2.6	MC	1	2	A
7	A	Predicts	2.7	MC	1	1	A
8	U	Compares	2.5	MC	1	1	B
9	U	Explains	3.1	MC	1	1	B
10	A	Infers	3.1	MC	1	2	A
11	U	Compares	3.2	MC	1	1	B
12	U	Interprets	3.3	MC	1	1	B
13	A	Analysis	3.4	MC	1	1	A
14	U	Relates	4.3	MC	1	1	B
15	U	Translates	4.4	MC	1	1	B
16	A	Infers	4.4	MC	1	3	A
17	A	Analyses	4.4	MC	1	2	A
18	U	Detects error	4	MC	1	1	B
19	U	Detect Error	4	MC	—1	1	B. --

(7.2)

20	U	Relates	5	MC	1	1	B
21	U	Translates	6	MC	1	1	B
22	A	Analyses	6	MC	1	2	A
23	U	Compares	6	MC	1	2	B
24	A	Analyses	6	MC	1	2	A
25	U	Compares	6	MC	1	2	B
26	U	Calculates	6	MC	1	1	C
27	U	Compares	6	MC	1	2	B
28	U	Calculates	6	MC	1	1	C
29	A	Judges	6	MC	1	1	C
30	A	Infers	6	MC	1	3	A
31	U	Interprets	6	MC	1	1	B
32	U	Compares	6	MC	1	2	B
33	A	Analyses	6	MC	1	3	A
34	A	Analyses	6	MC	1	2	A
35	A	Analyses	6	MC	1	2	A
36	U	Interprets	6	MC	1	2	A
37	U	Interprets	6	MC	1	1	B
38	A	Analyses	6	MC	1	1	A
39	A	Judges	6	MC	1	3	A
40	A	Analyses	6	MC	1	2	A
41	U	Relates	7	MC	1	1	B
42	U	Compares	7	MC	1	2	B
43	A	Predicts	7	MC	1	2	A

(7.3)

44	A	Analyses	7	MC	1	2	
45	A	Analyses	7	MC	1	2	A
46	A	Analyses	7	MC	1	2	A
47	A	Establishes relationship	7	MC	1	2	A
48	U	Translates	7	MC	1	1	A
49	U	Relates	8	MC	1	2	B
50	A	Gives reason	8	MC	1	1	B
51	U	Translates	8	MC	1	1	A
52	A	Gives reason	8	MC	1	1	B
53	A	Analyses	8	MC	1	2	A
54	U	Interprets	8	MC	1	1	B
55	A	Establishes relationship	8	MC	1	1	A
56	A	Analyses	9	MC	1	1	A
57	U	Translates	9	MC	1	2	B
58	U	Interprets	9	MC	1	2	A
59	U	Extrapolates	9	MC	1	2	A
60	A	Analyses	9	MC	1	2	A
61	U	Compares	10	MC	1	1	B
62	U	Interprets	10	MC	1	1	B
63	U	Interprets	10	MC	1	1	B
64	U	Calculates	10	MC	1	2	B
65	A	Analyses	11	MC	1	2	A
66	U	Relates	11	MC	1	1	B

(7.4)

67	U	Interprets	11	MC	1	1	B
68	U	Relates	11	MC	1	1	B
69	A	Analyses	11	MC	1	1	A
70.	A	Analyses	11	MC	1	2	A
71	A	Analyses	12	MC	1	2	A
72	U	Interprets	12	MC	1	1	B
73	U	Compares	12	MC	1	1	B
74	A	Predicts	13	MC	1	2	A
75	A	Infers	13	MC	1	2	A
76	U	Translates	14	MC	1	1	B
77	U	Translates	14	MC	1	1	B
78	A	Analyses	15	MC	1	1	A
79	A	Analyses	15	MC	1	2	A
80	A	Predicts	15	MC	1	1	A
81	A	Judges	15	MC	1	1	A
82	A	Analyses	15	MC	1	1	A
83	A	Predicts	15	MC	1	1	A
84	A	Infers	15	MC	1	2	A
85	U	Interprets	15	MC	1	1	A
86	U	Translates	15	MC	1	1	B
87	U	Explains	15	MC	1	1	B
88	U	Relates	16	MC	1	1	B
89	U	Relates	16	MC	1	1	B

(7.5)

90	A	Makes hypothesis	16	i	MC	-1	2	A
91	U	Compares	16		MC	1	1	B
92	U	Compares	16		MC	1	1	B
93	A	Infers	16		MC	1	2	A
94	U	Interprets	16		MC	1	2	B
95	U	Compares	16		MC	1	1	B
96	U	Relates	16		MC	1	1	B
97	U	Relates	17		MC	1	1	B
98	A	Judges	17		MC	1	1.5	A
99	A	Analyses	17		MC	1	1.5	A
100	U	Relates	17		MC	1	1	B
101	A	Establishes relationship	18		MC	1	2	A
102	A	Analyses	18		MC	1	2	A
103	U	Relates	18		MC	1	1	B
104	U	Interprets	18		MC	1	1	B
105	A	Establishes relationship	18		MC	1	1	A
106	U	Relates	18		MC	1	1	B
107	U	Relates	18		MC	1	1	B
108	A	Gives reason	18		MC	1	1	A
109	A	Gives reason	18		MC	1	1	A
110	U	Identifies relationship	18		MC	1	1	B

(7.6)

111	A	Analyses	18	MC	1	1	B
112	U	Interprets	19	MC	1	1	B
113	U	Identifies relationship	19	MC	1	1	B
114	U	-do-	19	MC	1	1	B
115	U	Interprets	19	MC	1	1	B
116	A	Analyses	19	MC	1	1.5	B
117	U	Explains	19	MC	1	1	B
118	U	Identifies relationship	19	MC	1	1	B
119	A	Infers	19	MC	1	2	A
120	U	Classified	20	MC	1	1	B
121	U	Explains	20	MC	1	1	B
122	A	Gives reason	20	MC	1	1	A
123	U	Compares	21	MC	1	1	B
124	U	Classifies	21	MC	1	1	B
125	A	Establishes relationship	21	MC	1	1	B
126	A	Analyses	21	MC	1	1	B
127	A	Analyses	21	MC	1	1	B
128	U	Identifies relationship	21	MC	1	1	B

APPENDIX - A

LIST OF INSTRUCTIONAL OBJECTIVES OF SCIENCE

1.0 KNOWLEDGE

The pupil AQUIRES KNOWLEDGE OF biological terms, facts, procedures, processes, concepts, principles and themes.
Expected Learning Outcomes (SPECIFICATION):

The pupil

1.1 recalls scientific facts, concepts, principles, etc.

1.2 recognises Scientific apparatus, specimens, facts,

2.0 UNDERSTANDING

The pupils DEVELOPS UNDERSTANDING of tems, facts concept, Principles, etc. related to science

Expected Learning outcomes (SPECIFICATIONS)

The pupil

2.1 translates Scientific terms, symbols, formulae, day , etc. from one form to another.

2.2 cities illustrations of scientific principles concepts, phenomena, etc.

2.3 identified relationship between various concepts, processes, etc., related to science.

(A-2)

- 2.4 detects errors in experiments, processes, statements, etc. related to science.
- 2.5 Compares scientific terms, concepts, principles, etc.
- 2.6 classified specimens, facts, concepts, etc.
- 2.7 interprets concepts, data, graphs, etc.
- 2.8 explains concepts, principles, processes, etc.

3.0 APPLICATION

The pupil APPLIES knowledge and understanding of science in unfamiliar situations.

EXPECTED Learning Outcomes (SPECIFICATION)

The pupil

- 3.1 analyses the given data or observed scientific facts and phenomena to identify different components.
- 3.2 formulates hypotheses on the basis of given data or observed facts and phenomena.
- 3.3 Suspects appropriate and alternative experimental procedures, for a given purpose.
- 3.4 give reason for certain causes and effects in scientific phenomena
- 3.5 draws conclusions from the given data.

(A-3)

3.6 generalizes on the basis of his observations or given data.

3.7 predicts scientific phenomena from the observed facts
or given data.

3.8 judges the relevance, accuracy and consistency of scientific concepts and principles in the given data, experimental procedures and other scientific phenomena.

4.0 SKILLS

The pupil develops Skill in

4.10 drawing diagrams, charts, graphs, sketches, etc.
pertaining to science.

4.20 manipulation apparatus and instruments.

4.30 collecting, mounting and preserving specimens.
4.40 describing scientific specimens, phenomena
structures, etc.

4.50 reporting information, evidence and results, using
scientific terminology.

Expected Learning Outcomes (SPECIFICATIONS):

4.10 DRAWING SKILLS

The pupil

4.11 draws diagrams, charts, etc. of observed or given

(A-4)

specimens, material, apparatus and instruments
skillfully.

- 4.12 completes the incomplete diagrams correctly.
- 4.13 recognises the various structures in the sketches and diagrams concerned with various functions.
- 4.14 copies sketches and diagrams methodically and correctly.
- 4.15 draws sketches and diagrams neatly at a reasonable speed.

4.20 MANIPULATIVE SKILLS:

- 2.41 arranges the apparatus systematically.
- 4.22 handles the apparatus and instruments carefully.
- 4.23 reads the instruments and apparatus with precision.
- 4.24 maintains the apparatus and instruments in order.
- 4.25 improvises apparatus and models, using locally available materials.

4.30 COLLECTING, MOUNTING AND PRESERVING SKILLS:

- 4.31 locates the right habitat or location for a particular specimen, material etc.
- 4.32 gathers the required material during the appropriate seasons.

(A-5)

4.33 handles efficiently the appropriate equipment and instrument for collection of specimens, materials, etc.

4.34 uses the appropriate materials economically to mount the specimens.

4.35 Selects the right preservatives for different specimens.

4.40 OBSERVING SKILLS:

The pupil

4.41 notices the relevant details in the given specimens and scientific phenomena carefully.

4.42 reads the apparatus and instruments correctly.

4.43 discriminates between closely related structures, parts and specimens accurately.

4.44 locates the desired parts in a dissection or specimen exactly.

4.45 detects errors in experimental set-up and procedures.

4.50 REPORTING SKILLS:

The pupil

4.51 selects the appropriate scientific terminology in describing specimens and phenomena.

(A-6)

4.52 uses the appropriate terms in proper sequence and right context.

4.53 puts the ideas in clear, precise and unambiguous terms.

4.55 tabulates the data or evidence in appropriate form.

4.56 presents the scientific information in a logical order.

4.57 summarises the data and evidences in accordance with the desired pattern.

OBJECTIVE

5.0 APPRECIATIONS

The pupil APPRECIATES the scientific phenomena in nature and the role of science in human welfare.

Expected Learning Outcomes (SPECIFICATIONS):

The pupil

5.1 recognises the unity of life in diversity of form.

5.2 singnifies the interrelationships among various types of organisms.

5.3 develops insight into the means and methods of science used for exploiting nature and natural

(A-7)

resources for human welfare.

- 5.4 understands the role of tools and techniques of science in the development of sciences.
- 5.5 realises the struggle for existence among living organisms and the role of adaptation for adjustment.
- 5.6 gets thrilled at the beauty of nature and is convinced of the role of biology in developing aesthetic sense in human beings.
- 5.7 feels the importance of science as inquiry in exploring the secrets of nature.
- 5.8 visualises the impact of science on Social behaviors.

6.0 INTERESTS

The pupil develops INTEREST in the living and material world.

Expected Learning Outcomes (SPECIFICATIONS):

The pupil

- 6.1 enjoys collecting, mounting, preserving and displaying specimens of scientific interest.
- 6.2 Participates voluntarily in science club activities.

(A-8)

- 6.3 frequently writes articles in school and other magazines related to science.
- 6.4 visit on his own the botanical gardens, zoos, museums, factories, dams, and other places of scientific interest.
- 6.5 undertakes hobbies such as improvising scientific models, gardening, and field-study in his spare time.
- 6.6 reads regularly the books and journals on the life and works of scientists with pleasure.

7.0 SCIENTIFIC ATTITUDE

The pupil develops SCIENTIFIC ATTITUDE towards natural and physical phenomena.

Expected Learning Outcomes (SPECIFICATIONS):

The pupil

- 7.1 becomes inquisitive about the scientific phenomena
- 7.2 is open minded in accepting other's view points.
- 7.3 believes in cause and effect relationship.
- 7.4 does not accept things without proof or justification.

(A-9)

7.5 suspends judgement in the absence of
adequate evidence.

7.6 shows perseverance in undertaking scientific
activities.

7.7 manifests intellectual honesty in reporting
results of experiments.

APPENDIX - B

ITEM SHEET

CLASS & SUBJECT: _____ UNIT _____

OBJECTIVE : _____ SUBJECT _____

SPECIFICATION : _____ MARKS _____

FORM OF QUESTION: _____ ESTIMATED TIME _____

ESTIMATED DIFFICULTY LEVEL: _____ DATE: _____

Q. No.

MARKING SCHEME

NOTE: Give key for Objective type, complete expected answer for very short and Short answer type questions and outline answer for Essay type question.

TEXT BOOK USED:

ITEM WRITER:

Appendix-C

List of Participants of the Workshop for Editing and
Redinement of Sample questions Developed in Biology
for Open Book Examination for class IX.

Dr. Rajendra Nath Gupta
Professor in Botany
Govt. Science College,
Gwalior, M.P.

9. Sri Virendra Srivastave
SSLT Gujarat Sr. Sec.
School, Raj Niwas Marg
Delhi-110054

Sri G.R. Singhal
Retd. Principal
Patankar Bazar
Gwalior-474001

10. Mrs. Sananda Sen
T.G.T. (Physics)
Apeejay School,
Sheikh Sarai,
New Delhi

Dr. Anand Kumar Srivastav,
Lecturer,
Govt. Post Graduate College,
Rishikesh, U.P.

Mrs. Usha Lamba,
PGT & Head (Dept. of Biology)
Lady Irwin School
Curzon Road,
New Delhi-110001

Dr. M.C. Bhatnagar
Retired Reader in Chemistry
C/o Lt. Alok Bhatnagar
INS CANNANDEE
C/o F.M.O. Visakhapatnam
(A.P)

Dr. H.S. Vishnoi
Reader
Dept. of Zoology,
University of Delhi - 110007

Dr. Shiva Sharma
Associate Professor
Dept. of Botany,
University of Rajasthan
Jaipur-302004

Dr. B.D. Atreya
Professor (Retired) NCERT
22 AGCR Enclave, Delhi-110092

APPENDIX-D

B I B L I O G R A P H Y

Ahmann, J.S. and M.D. Glock, Evaluating Pupil Growth: Principles of Tests and Measurement, Allyn and Bacon, Boston, 1967.

Black, H. and P. Broafoot, Keeping Track of Teaching. Routledge, Kingant & Paul, 1982.

Bloom, B.S. and others, Taxonomy of Educational objectives, Handbook 1, cognitive Domain. David McKay Co.,

_____, H.J. Thomas, and M. George, Handbook on Formative and Summative Evaluation of Student Learning. Mc Graw Hill Book Co., New York, 1971.

Brown, F.G., Principles of Educational and Psychological Testing. Rinahart and Winston, Ne York, 1976

Cronbach, N.E., Measurement and Evaluation in Teaching. Machmil'an Publishing Co., Inc., 1'76.

Ebel, R. . Essentials of Educational Measurement and Evaluation. Prentice-Hall, N.J., 1979.

Gronlund, N.E., Measurement and Evaluation in Teaching. (3rd ed.) Mecmillan Publishing Co. Inc., New York, 1976.

Hedges, W.D., Testing and Evaluation for the Sciences in Secondary Schools. Wadsworth, 1966

Hill, W.H., "How Examinations Influence Methods of Study". Rajasthan Board Journal of Education, January, 1967

Hudson, B., Assessment Techniques; An introduction,
Methuen Educational Ltd., London, 1973

Julian, C.S. and K.D. Dieppins, Educational and Psychological
Measurement and Evaluation. Prentice-Hall of India
Pvt. Ltd., New Delhi, 1978.

Karmel, L.J. and M.C. Karmel, Measurement and Evaluation in
the Schools (2nd Ed.). Macmillan, New York, 1977.

Lindquist, E.F. (Ed.), Educational Measurement American
Council of Education, Washington D.C., 1961.

Macashen, M.M., Writing Behavioural Objectives : A New
Approach. Harper and Row, New York, 1971.

Marshal, J.C., and L.W. Hales, Classroom Test Construction.
Addison-Wesley, Inc., Mass., 1971.

Macintosh, H.G.(ed.), Techniques and Problems of Assessment:
A Practical Handbook for Teaching.
Edward Arnold, London, 1977.

Mehrans, W.A. and I.J. Lehmann, Measurement and Evaluation
in Education and Psychology. Holt, Rinehart & Winston,
New York, 1978.

Natrajan, V., Towards Better Questions (Item Writers' Cook
Book). Association of Indian Universities, New Delhi,
1978.

Noll, V.H., and others, Introduction to Educational Measurement.
Houghton Mifflin, Boston, 1979.

Pophan, W.J., Modern Educational Measurement. Prentice-Hall
N.J. 1981.

Scannell, D, and D.S. Tracy, Testing and Measurement in the Classroom. Houghton Mifflin, Boston, 1975.

Science : A Textbook for class VI, NCERT Publication, 1987.

Science : A Textbook for class VII, NCERT Publication, 1988.

Science: A Textbook for class VIII (Part I & II), NCERT Publication, 1989.

Science: A Text book for class IX (Part I & II), N.C.E.R.T. publication, 1988.

Science: A Text book for class X (Part I & II), N.C.E.R.T., Publication, 1989.

Singh: Pritam (Ed.) Evaluation at the Secondary Stage. National Council of Educational Research & Training, New Delhi, 1986.

Srivastava, H.S., Pritam Singh, and V.S. Anand, Reforming Examinations. Some Emerging Concepts. National Council of Educational Research & Training, New Delhi, 1978.

Stoker, H.W., and R.P. Kropp, "Measurement of Cognitive Processes". Journal of Educational Measurement, 1, 1964, 39-42.

Tenbrink, T.D., Evaluation: A Practical Guide for Teachers. Mc Graw-hill, New York, 1974.

Tuckman, B.W., Measuring Educational Outcomes. Fundamentals of Testing. Harcourt Brade, San Francisco, 1975.

Worthen, B.R., and J.H. Sanders, Educational Evaluation Theory and Practices. Washington, 1973.

Yadav, M.S., and R. Govinda, Educational Evaluation: A Package of Auto-instructional Materials. Sahitya Mudranalaya, Ahmedabad, 1977.